Autodesk® Moldflow® Insight 2012

AMI Microchip Encapsulation Analysis Results

Autodesk®

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Microchip Encapsulation analysis results 1

This help topic provides an overview of the results generated by a Microchip Encapsulation analysis.

Text based results

The following table lists the text results generated for a Microchip Encapsulation analysis.

Results
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Results Summary
Analysis Check

Graphical results

The following table lists the graphical results that are created by a Microchip Encapsulation analysis and indicates whether each result is supported for the following analysis technologies:

- Midplane
- Dual Domain
- 3D

A Microchip Encapsulation analysis generates the filling, curing, and stress results listed in the table below. For more information about a result, including how to interpret the display, click on the result name.

NOTE: The Microchip Encapsulation results generated will depend on the mesh type, and the wire sweep/paddle shift related solver parameters that you set. Using the advanced solver settings in the Process Settings Wizard, you can select a small deflection or large deflection Stress analysis, and you can select whether the wire sweep/paddle shift simulation should be performed by Autodesk Moldflow Insight Stress or Abaqus.

TIP: To display results of a 3D Wire Sweep analysis effectively, it is important to enable the results visualization option to **Display 1D elements as segments**. If this option is not enabled, result display could be very slow, especially on models that contain many wires.

Click  **Application menu**, then click **Options > Results tab** and in the **Optimize memory for results display** area, click in the **Display 1D elements as segments** checkbox to enable this option.

Flow (Fill+Pack / filling and curing phase) results	Analysis technology
Fill time	
Clamp force	
Pressure	
Flow rate, beams	
Average velocity	
Orientation at core	
Orientation at skin	
Shear rate, bulk	
Shear stress at wall	
Bulk conversion at end of process[1]	
Bulk temperature at end of fill	
Bulk temperature, nodal[1]	
Cured layer fraction[1]	
Pressure at end of fill[1]	
Air traps[2]	
Pressure at injection location[2]	
Pressure at V/P switchover[2]	
Temperature at flow front[2]	
Volumetric shrinkage[2]	
Volumetric shrinkage (3D)	
% Shot weight[2]	
Bulk conversion[2]	
Bulk temperature[2]	

[1] For Midplane and Dual Domain analysis technologies, these results are produced only when you have selected an analysis sequence that includes the Incompressible solver.

[2] For Midplane and Dual Domain analysis technologies, these results are produced only when you have selected an analysis sequence that includes the Compressible solver.

Flow (Fill+Pack / filling and curing phase) results	Analysis technology
Frozen layer fraction[2]	
Grow from[2]	
In-cavity residual stress in first principal direction[2]	
In-cavity residual stress in second principal direction[2]	
Sink index[2]	
Throughput[2]	
Volumetric shrinkage at ejection[2]	
Weld lines[2]	
Weld and meld lines[2]	
Air traps, including air vents[3]	
Conversion at node	
Density	
Extension rate	
Polymer filled region	
Shear rate (3D)	
Shear rate, maximum	
Temperature (3D)	
Unfilled cavity[4]	
Velocity (3D)	
Vent region pressure[3]	

[3] This result is available only when the option to Perform venting analysis is selected in the solver parameters.

[4] This result is only available if a short shot occurs during the analysis.

Flow (Fill+Pack / filling and curing phase) results	Analysis technology
Viscosity	
Pressure difference, maximum (paddle shift) result on page 9[5]	
Volume change (Runner balance)	

Stress / Wire Sweep & Paddle Shift results	Analysis technology
Deflection	
First principal stress (wire sweep/paddle shift)	
Second principal stress (wire sweep/paddle shift)	
Max shear stress (wire sweep/paddle shift)	
Wire-sweep index result on page 10[6]	
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Maximum wire sweep index - Wire number: XY Plot result on page 14[7]	
Wire pairs within critical clearance result on page 15[7]	
Distance to closest wire result on page 16[7]	
Stress in first principal direction (stress)	
Stress in second principal direction (stress)	
Maximum shear stress (stress)	

[5] This result is only shown when Abaqus is used for the analysis

[6] In order to calculate this result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

[7] In order to calculate this result, the analysis sequence must include Wire Sweep, and the wire sweep calculation must be performed in Autodesk Moldflow Insight.

Stress / Wire Sweep & Paddle Shift results	Analysis technology
Stress, Mises-Hencky (stress)	

Warp results	Analysis technology
Deflection, all effects[2]	

NOTE: The Microchip Encapsulation filling and curing and warp results are the same as for Reactive Molding.

Deflection, in-plane (wire sweep) result

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The Deflection, in-plane (wire sweep) result displays the predicted X-Y (in-plane) deformation of the wire resulting from the encapsulation process.

This result is generated by a Microchip Encapsulation analysis where the wire sweep calculation was performed in Autodesk Moldflow Insight.

Using this result

X-rays of actual wire displacement are normally measured in the plane. This result is therefore particularly useful for comparing the simulated results with experimental results.

Microchip Encapsulation analysis log

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The Microchip Encapsulation analysis log is a text report that lists the inputs that you used for the analysis, including solver parameters, material data, process settings an model details, followed by the analysis progress tables.

There is a separate table for the injection phase, and for the curing phase of the analysis. The Analysis Log is a text report generated by the Microchip Encapsulation analysis.

Using the analysis log

The Analysis Log for a Microchip Encapsulation analysis can be used to determine whether the part filled completely during injection before the curing phase began.

Look at the analysis progress table for the injection phase and check whether 100% of the cavity volume filled. If this did not occur, then you may see a message stating “The maximum machine injection pressure was reached at ...”, followed by **SHORT SHOT**.

NOTE: View the Warp/Stress Analysis Log for information on the wire sweep/paddle shift analysis.

Things to look for

Short shot If this problem occurs, try changing the following process settings (in the order presented) and re-run the analysis.

1 Melt and mold temperatures (primary)
2 Fill time (primary)
3 Pressure (secondary)

Pressure difference (paddle shift) result

4

The Pressure difference result shows you the difference in pressure, over time, between the upper and lower cavities separated by the leadframe.

It is generated by a Microchip Encapsulation analysis.

Using this result

The pressure difference value is used in the paddle-shift calculation.

- A positive value means that the pressure in the lower cavity is greater.
- A negative value means that the pressure in the upper cavity is greater.

Pressure difference, maximum (paddle shift) result

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The Pressure difference, maximum (paddle shift) result shows you the maximum difference in pressure, over time, between the upper and lower cavities separated by the leadframe.

This result is generated by a Microchip Encapsulation analysis.

Using this result

The maximum pressure difference value is used in the paddle-shift calculation.

- A positive value means that the pressure in the lower cavity is greater.
- A negative value means that the pressure in the upper cavity is greater.

NOTE: The pressure difference changes during the filling process. This result represents the *maximum* pressure difference during filling.

Wire-sweep index result

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The Wire-sweep index result is a representation of the force created by the flow of plastic past the wires of an integrated circuit.

The Wire-sweep index result is generated by a Microchip Encapsulation analysis.

A wire-sweep index is calculated and plotted for each wire, as follows:

- The analysis finds the point on the wire where displacement in the planar direction is greatest.

  NOTE: With Dual Domain analysis technology, the point that has the maximum displacement of the whole wire is used. With 3D analysis technology, nodes in each segment that have the maximum displacement in that segment are used.

- It divides this maximum displacement by the length of the wire.
- The result is the wire-sweep index for the individual wire.

NOTE: In order to calculate the Wire sweep index result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

TIP: Edit the Microchip Options Solver parameters ( **Home tab > Molding Process Setup panel > Process Settings** , **Profile Settings** page, **Advanced Options** button, **Solver parameters** area, then click **Edit** to display the **Reactive molding solver parameters** dialog). Select the **Wire Sweep/Paddle Shift** tab. Set the **Perform wire sweep/paddle shift simulation in** drop down box to Autodesk Moldflow Insight.

XY deflection (wire sweep) result

7

The XY deflection (wire sweep) result displays the predicted X-Y (in-plane) deformation of the wire resulting from the encapsulation process.

This result is generated by a Microchip Encapsulation analysis where the wire sweep calculation was performed in Abaqus.

Using this result

X-rays of actual wire displacement are normally measured in the plane. This result is therefore particularly useful for comparing the simulated results with experimental results.

Wire number result 8

The Wire number result graphically shows the identification number assigned to each wire.

The Wire number result is generated by a 3D Microchip Encapsulation analysis when the selected analysis sequence includes Wire Sweep.

The analysis assigns the wire identification number based on the node number of each wire node. A wire that has a smaller node number will be assigned a lower wire number. The wire that has the lowest node number is assigned the wire number one.

Using this result

Use the animation controls to more easily identify the locations of individual wires in the graphical display.

NOTE: In order to calculate the Wire number result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

TIP: This option is set on the **Microchip Options** tab of the **Reactive Molding solver parameters (3D)** dialog. Double-click **Process Settings** in the Study Tasks pane, or click (**Home tab > Molding Process Setup panel > Process Settings**) to open the **Process Settings Wizard**. Click **Next** to display the **Profile Settings** page; click **Advanced options**; click **Edit** in the **Solver parameters** area; and click the **Microchip Options** tab. Set the **Perform wire sweep/paddle shift simulation in** option to Autodesk Moldflow Insight.

Maximum wire deflection magnitude - Wire number: XY Plot result

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The Maximum wire deflection magnitude - Wire number: XY Plot result shows the maximum deflection value of each wire in the model.

The Maximum wire deflection magnitude - Wire number: XY Plot result is generated by a 3D Microchip Encapsulation analysis when the selected analysis sequence includes Wire Sweep.

The single maximum value of the wire deflection predicted for each wire is plotted versus the wire number.

Using this result

Use this information to identify individual wires that undergo the most deflection.

NOTE: In order to calculate the Maximum wire deflection magnitude - Wire number: XY Plot result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

TIP: This option is set on the **Microchip Options** tab of the **Reactive Molding solver parameters (3D)** dialog. Double-click **Process Settings** in the Study Tasks pane, or click (**Home tab > Molding Process Setup panel > Process Settings**) to open the **Process Settings Wizard**. Click **Next** to display the **Profile Settings** page; click **Advanced options**; click **Edit** in the **Solver parameters** area; and click the **Microchip Options** tab. Set the **Perform wire sweep/paddle shift simulation in** option to Autodesk Moldflow Insight.

Maximum wire sweep index - Wire number: XY Plot result 10

The Maximum wire sweep index - Wire number: XY Plot result shows the maximum wire sweep index value of each wire in the model.

The Maximum wire sweep index - Wire number: XY Plot result is generated by a 3D Microchip Encapsulation analysis when the selected analysis sequence includes Wire Sweep.

The single maximum value of the wire sweep index predicted for each wire is plotted versus the wire number.

Using this result

Use this information to identify individual wires that undergo the greatest drag force during cavity filling.

NOTE: In order to calculate the Maximum wire sweep index - Wire number: XY Plot result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

TIP: This option is set on the **Microchip Options** tab of the **Reactive Molding solver parameters (3D)** dialog. Double-click **Process Settings** in the Study Tasks pane, or click (**Home tab > Molding Process Setup panel > Process Settings**) to open the **Process Settings Wizard**. Click **Next** to display the **Profile Settings** page; click **Advanced options**; click **Edit** in the **Solver parameters** area; and click the **Microchip Options** tab. Set the **Perform wire sweep/paddle shift simulation in** option to Autodesk Moldflow Insight.

Wire pairs within critical clearance result

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The Wire pairs within critical clearance result shows number of wire pairs for which the predicted clearance after wire deformation is equal to or less than the specified critical clearance value.

The Wire pairs within critical clearance result is generated by a 3D Microchip Encapsulation analysis when the selected analysis sequence includes Wire Sweep.

The plot shows the number and location of wire pairs for which predicted clearance between the wires is within the critical clearance.

NOTE: The **Critical clearance between wires** value is specified in the solver parameters. The default value is zero, indicating that the surfaces of adjacent wires can touch.

Using this result

Use this information to identify pairs of wires that are too close together after wire deformation occurs during cavity filling.

NOTE: In order to calculate the Wire pairs within critical clearance result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

TIP: This option is set on the **Microchip Options** tab of the **Reactive Molding solver parameters (3D)** dialog. Double-click **Process Settings** in the Study Tasks pane, or click (**Home tab > Molding Process Setup panel > Process Settings**) to open the **Process Settings Wizard**. Click **Next** to display the **Profile Settings** page; click **Advanced options**; click **Edit** in the **Solver parameters** area; and click the **Microchip Options** tab. Set the **Perform wire sweep/paddle shift simulation in** option to Autodesk Moldflow Insight.

Distance to closest wire result 12

The Distance to closest wire result shows, for each wire, the distance to the nearest other wire in the model.

The Distance to closest wire result is generated by a 3D Microchip Encapsulation analysis when the selected analysis sequence includes Wire Sweep.

The plot shows the location of individual wires with the distance to the closest other wire, after wire deformation has occurred during cavity filling.

Using this result

Ideally, wire spacing should be uniform. Use this information to identify wires that are too close or too far from adjacent wires.

NOTE: In order to calculate the Distance to closest wire result, the wire sweep calculation must be performed in Autodesk Moldflow Insight.

TIP: This option is set on the **Microchip Options** tab of the **Reactive Molding solver parameters (3D)** dialog. Double-click **Process Settings** in the Study Tasks pane, or click (**Home tab > Molding Process Setup panel > Process Settings**) to open the **Process Settings Wizard**. Click **Next** to display the **Profile Settings** page; click **Advanced options**; click **Edit** in the **Solver parameters** area; and click the **Microchip Options** tab. Set the **Perform wire sweep/paddle shift simulation in** option to Autodesk Moldflow Insight.
